Cumulative Impact Analysis
Okanogan County SMP
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Purpose

This section describes the general State requirements for cumulative impact analysis and discusses the methodology for analyzing potential impacts to Okanogan County shorelines**.** The draft Shoreline Master Program (SMP) proposes changes to the development regulations that encourage shoreline protection and avoidance, minimization and mitigation activities that would cause adverse impacts to shoreline functions and processes. The cumulative impact analysis for the Okanogan County SMP will incorporate the effects of past, present, and future actions within the County's watersheds.

The Shoreline Management Act guidelines require shoreline master programs to regulate new development and to maintain no net loss of shoreline ecological functions. While some impacts are immediate and can be directly addressed through avoidance and mitigation, other impacts are cumulative in nature. The composite of many similar actions over time may lead to a significant cumulative impact to the ecosystem. For example, a small area of impervious surface may have only a negligible impact on the environment. On the other hand, numerous impervious surfaces throughout a watershed over time could lead to significant impacts, such as: channel erosion, water quality degradation, and decreased vegetation.

Key components of the SMP are the development of regulations and mitigation requirements. These requirements are important to achieving no net loss of shoreline ecological functions, but they cannot achieve this goal on their own. Even with mitigation provided, one hundred percent replacement of lost function is difficult if not impossible to achieve. As a result, restoration programs are a key component of achieving no net loss of ecological function.

Assumptions

This analysis is looking at foreseeable impacts over time. These impacts are being looked at by a group of Analysis Units (AUs) that represent a stream or lake reach. This method is consistent with the SMP Shoreline Characterization Report. The analysis focused on areas where greater development and land use change is expected. Site specific impacts are also expected to be addressed on a case-by-case basis during individual future project reviews.

Methodology

The following steps were used to conduct the cumulative impact analysis for no net loss.

Step 1. Group AU's on a common stream or lakeshore

Analysis Units were grouped by a common stream or lakeshore for the no net loss analysis at the scale of a single stream or lake. A total of 233 AUs were identified along Okanogan County shorelines. These were organized into 87 groups. General descriptions

of the 87 AU groups are described in Attachment 2. Table 1 and Table 2 provide a listing of AUs within each lake or stream group.

Table 1 Lake groups with associated AUs and the number of parcels analyzed per group

Lake Group Name	AU code	# parcels
AENEAS LAKE	L AEN 00	20
ALBRIGHT LAKE	L ALB 00	6
ALKALI LAKE	L ALK 00	31
ALTA LAKE	L ALT 00	75
BIG TWIN LAKE	L BIG 00	35
BLUE LAKE	L BLU 00	33
BLUE LAKE (SIN)	L BLS 01	13
	L BLS 02	
BONAPARTE LAKE	L BON 01	11
	L BON 02	
	L BON 03	
BOOHER LAKE	L BOO 00	3
BROWN LAKE	L BRO 00	18
CHOPAKA LAKE	L CHO 00	12
CRAWFISH LAKE	L CRA 00	32
DAVIS LAKE	L DAV 00	26
DUCK LAKE	L DUC 00	13
EAST OSOYOOS	L OSO 03	130
	L OSO 04	
EVANS LAKE	L EVA 00	4
FANCHER DAM RES	L FAN 00	7
FIELDS LAKE	L FIE 00	1
FISH LAKE	L FIS 00	7
GREEN LAKE	L GRE 00	7
HORSESHOE LAKE	L HOR 00	10
CONCONULLY LAKE	L CON 01	35
	L CON 02	
	L CON 03	
	L CON 04	
SALMON/ CONCONULLY LAKE	L SAL 01	23
	L SAL 04	
LEADER LAKE	L LEA 00	17
LEMANASKI LAKE	L LEM 00	10
LITTLE TWIN LAKE	L LIT 00	14
MEDICINE LAKE	L MED 00	4

Lake Group Name	AU code	# parcels
MOCCASIN LAKE	L MOC 00	1
MOLSON LAKE	L MOL 00	10
MUSKRAT LAKE	L MUS 00	9
PALMER LAKE	L PAL 01	108
	L PAL 02	
	L PAL 03	
	L PAL 04	
PATTERSON LAKE	L PAT 00	45
PEARRYGIN LAKE	L PEA 01	43
	L PEA 02	
RAT LAKE	L RAT 00	9
ROBERTS LAKE	L ROB 00	6
SIDLEY LAKE	L SID 00	50
SPECTACLE LAKE	L SPE 01	109
	L SPE 02	
	L SPE 03	
	L SPE 04	
	L SPE 05	
	L SPE 06	
TALKIRE LAKE	L TAL 00	8
WALKER LAKE	L WAL 00	3
WANNACUT LAKE	L WAN 01	171
	L WAN 02	
	L WAN 03	
	L WAN 04	
LOWER WELLS POOL	S COL 01	62
	S COL 02	
WEST OSOYOOS	L OSO 01	215
	L OSO 02	
WHITESTONE LAKE	L WHI 01	29
	L WHI 02	
	L WHI 03	

MILES LAKE	L MIL 00	9

Table 2 Stream groups with associated AUs and the number of parcels analyzed per group

Stream Group Name	# parcels	AU Code
ANTOINE CREEK	34	S ANT 01
		S ANT 02
		S ANT 03
BEAVER CREEK	77	S BEA 01
		S BEA 02
		S BEA 03
		S BEA 04
BONAPARTE CREEK	186	S BON 02
		S BON 03
		S BON 04
		S BON 05
		S BON 06
		S BON 07
		S BON 08
		S BON 09
BREWSTER	338	S COL 04
		S COL 05
		S OKA 01
CARLTON LAMIRD	60	S MET 13
CHEWACK RIVER	253	S CHE 02
		S CHE 03
		S CHE 04
		S CHE 05
		S CHE 06
		S CHE 07
		S CHE 08
GOLD CREEK	47	S GOL 01
		S GOL 02
LAKE PATEROS	158	S COL 03
		S MET 01
		S MET 02
LOST CREEK	22	S LOS 01
		S LOS 02
		S LOS 03
		S LOS 04
		S LOS 06
		S LOS 07
LOWER SINLAHEKIN	28	S SIN 01
		S SIN 02
LOWER SIMILKAMEEN	49	S SIM 03
LOWER OKANOGAN	201	S OKA 09
MALOTT LAMIRD	48	S OKA 10
LOWER METHOW	129	S MET 03

Stream Group Name	# parcels	AU Code
		S MET 04
METHOW - CARLTON	308	S MET 06
		S MET 07
		S MET 08
		S MET 09
		S MET 10
		S MET 11
		S MET 12
CARLTON - TWISP	291	S MET 14
		S MET 15
		S MET 16
		S MET 17
		S MET 18
		S MET 19
		S MET 20
		S MET 21
		S MET 22
MAZAMA	302	S MET 31
		S MET 32
		S MET 33
		S MET 34
		S MET 35
		S MET 36
		S WOL 00
WINTHROP TOWN	398	S CHE 01
		S MET 29
		S MET 30
METHOW LAMIRD	137	S MET 05
MIDDLE SINLAHEKIN RIVER	44	S SIN 03
		S SIN 04
MIDDLE METHOW	159	S MET 25
		S MET 26
		S MET 27
		S MET 28
MIDDLE SIMILKAMEEN	120	S SIM 04
		S SIM 05
		S SIM 06
		S SIM 07
LOWER OKANOGAN	201	S OKA 02
		S OKA 03
		S OKA 04
		S OKA 05
		S OKA 06
		S OKA 07
		S OKA 08
MIDDLE OKANOGAN	65	S OKA 11
		S OKA 12

Stream Group Name	# parcels	AU Code
		S OKA 13
OMAK - RIVERSIDE	12	S OKA 20
KEYSTONE CANYON	143	S OKA 23
		S OKA 24
		S OKA 25
		S OKA 26
KEYSTONE - TONASKET	140	S OKA 27
		S OKA 28
		S OKA 29
UPPER OKANOGAN	402	S OKA 33
		S OKA 34
		S OKA 35
		S OKA 36
		S OKA 37
		S OKA 38
		S OKA 39
OKANOGAN CITY	266	S OKA 14
		S OKA 15
		S OKA 16
OMAK CITY	273	S OKA 17
		S OKA 18
		S OKA 19
OROVILLE CITY	288	S OKA 40
		S OKA 41
		S SIM 01
		S SIM 02
PALMER CREEK CONFLUENCE	99	S PAL 00
		S SIM 08
RIVERSIDE TOWN	137	S OKA 21
		S OKA 22
		S SAL 03
		S SAL 04
		S SAL 05
		S SAL 06
LOWER SALMON	27	S SAL 01
		S SAL 02
SINLAHEKIN HEADWATER	23	S SIN 05
		S SIN 06
		S SIN 07
WEST SANPOIL RIVER	100	S SAN 01
		S SAN 02
		S SAN 03
		S SAN 04
		S SAN 05
		S SAN 06
		S SAN 07
		S SAN 08

Stream Group Name	# parcels	AU Code
		S SAN 09
		S SAN 10
		S SAN 11
		S SAN 12
TOATS COULEE	33	S TOA 01
		S TOA 02
TONASKET CITY	265	S BON 01
		S OKA 30
		S OKA 31
		S OKA 32
TORODA CREEK	52	S TOR 01
		S TOR 02
TWISP TOWN	359	S MET 23
		S MET 24
		S TWI 01
TWISP RIVER	258	S TWI 02
		S TWI 03
		S TWI 04
		S TWI 05
		S TWI 06
UPPER METHOW	316	S EAR 01
		S EAR 02
		S MET 37
		S MET 38
		S MET 39
		S MET 40
UPPER SIMILKAMEEN	55	S SIM 09
		S SIM 10

Step 2. Existing Shoreline Conditions

As part of the County's Shoreline Master Program process, a shoreline inventory and characterization report was completed which assessed the degree to which ecological functions and processes in the shoreline jurisdiction have been altered. In general, the majority of Okanogan County shorelines are in a relatively unaltered condition. Since ratings were identified for individual AUs, the following steps describe the method to determine ratings for each stream and lake group.

1) The resource and condition indices for each AU were disaggregated into component parameters which were combined to create the index. For detailed methods, see Section 3 of the Shoreline Characterization Report.
2) For each stressor and resource parameter, scoring curves based on histograms were subdivided into ranges that reflect severity of effects, following a simple "high/medium/low" division.
3) Parameter scores were sorted by each stream and lake group and the results plotted using GIS to indicate where high, medium and low trends occurred within each group. Parameter trends were summarized for each group to

represent current impact to the existing shoreline condition. Data is presented in the summary table (Attachment 2) of potential cumulative impacts associated with the proposed Shoreline Master Program.

4) Existing shoreline conditions were mapped in terms of ecosystem-wide processes and functions based on SMP characterization. The method to highlight ecosystem key processes was based on Ecology's guidance, Chapter 17. This analysis identified and mapped areas important to sustain shoreline functions and determined the degree of alteration to key processes. Table 2 lists the indicators used to evaluate impacts to key ecosystem processes.

Table 3 Indicators to evaluate impacts to key ecosystem processes

Ecosystem processes	**Key areas**	**Alterations**
Sediment delivery and supply	Floodplains (slopes <4%) (movement, storage); lakes (storage); landslide hazard areas; highly erodible steep slopes (mass wasting delivery)	Roads within 200ft of shorelines; non-forested land cover on erodible slopes; non-forest land cover on mass wasting areas; roads within mass wasting areas; urban land cover
Water movement and storage	High permeability areas (sub-surface movement); low gradient floodplains (<4%) (storage, movement); high precipitation areas (delivery); lakes (storage)	Non-forested land cover on high permeable soils; impervious surfaces
Riparian inputs	Mass wasting areas directly upslope (delivery LWD); windthrow potential (delivery LWD within 75' of shoreline); unconfined channels (<4% slope) (storage)	Non-forested land cover in floodplains within 75ft of shoreline; non-forested land on mass wasting areas
Nutrient key delivery	Steep slopes with highly erodible soils	Agriculture and urban land cover

The indictors of key processes were overlaid spatially to highlight minimally altered areas and impaired areas. The results are presented both spatially and in summary form (Attachment 2 and 3).

Step 3. Identify and map proposed shoreline designations and Projected build-out and Reasonable Foreseeable Future Actions (RFFAs)

Allowable activities and protection requirements under proposed shoreline regulations are summarized and compared. Okanogan County proposed to use ten designations to regulate uses and modifications within the shoreline zones: Aquatic, Natural, Riverine/Lacustrine, Conservancy, Rural Resource, Rural Residential, Shoreline Recreation, Urban Conservancy, Shoreline Residential, and High Intensity. Potential

cumulative impacts to the Aquatic, Natural, and Riverine/Lacustrine designation are qualitatively discussed in this analysis.

RFFAs are based on shoreline designations (see Chapter 8 for details). RFFAs for each AU group were derived by analyzing data at the parcel scale and then calculating percent of each type at the stream and lake scale. A count of the total number of parcels per RFFA was calculated for each group. Next, the area percentage of total parcels assigned to the RFFA was calculated per group. For example, Aeneas Lake Group had 13 parcels assigned as medium intensity residential for a potential future land use, totaling an area of 14.66 acres. This area was divided by the total area of the Aeneas Lake group to calculate this RFFA type which was 26.5 percent of the entire group. This same process was calculated for all RFFAs. Those RFFAs with the highest percent per group was used to determine projected major types of development likely to affect shoreline condition. See Attachment 4 for data tables.

Due to spatial differences between the parcel and AU group data layers, those parcels that were split between two groups were placed into the group that contained greater than 25 percent of the entire parcel. For this reason, the RFFA area percents do not add up to 100 percent as represented in the data tables provided with this analysis.

Step 4. Illustrate the projected future under the proposed Program.
The timeframe is a maximum buildout potential based on an assumed future buildout according to proposed shoreline designations and associated development standards. The development of this analysis was to generally identify the extent of shorelines within each group that may be at risk from future development and to help guide restoration/enhancement efforts. Impervious surface was chosen to reflect an assumed future, factoring in required setbacks, buffers, and percent lot coverage. The maximum lot coverage per parcel (based on proposed shoreline designation type) was used as an estimate of potential future cumulative impact. Lot coverage is the percentage of the parcel within shoreline jurisdiction, less the required vegetation and use buffers (as outlined in Chapter 8) to be covered with impervious surfaces.

Other alterations that affect ecological processes and function are also correlated with impervious surfaces (e.g. vegetation removal, land clearing, and soil compaction). Impervious surfaces were chosen for this analysis because the concept has been a good indicator of cumulative impacts on the landscape (May et al. 1997, Stanley et al. 2005).

Step 5. Cumulative impact analysis for each group under proposed regulations.
This analysis determined which shorelines may be at risk from future developments. Only parcels that are located within the shoreline jurisdiction boundary are included. Existing impervious and potential future impervious surfaces were determined for shoreline parcels and the setback buffers associated with each parcel's shoreline designation. The National Land Cover Dataset (NLCD 2001) was used to determine impervious surface percent per AU group. Detailed GIS methods used to perform the impervious analysis are provided in Attachment 5.

Current impervious surface percent per group were compared to a hypothesized worst case scenario of possible future impacts (the maximum potential increase in impervious surface within the shoreline jurisdiction). To measure the difference between current and potential future conditions, a comparison of the percentage of impervious surface area per group was performed. The difference between scores revealed the potential positive or negative changes in shoreline conditions. Attachment 1 contains the Summary table.

Conclusions

This scenario shows a potential increase in the percent impervious surface for shoreline areas. Cumulative impacts to the shoreline may result from a wide range of possible actions. The focus of foreseeable development is on those actions that have been identified as potential impacts to the shoreline and that are or would be foreseeable based on past development patterns and shoreline regulations.

The Okanogan shoreline is unlikely to experience much more development, as much of the property in public ownership is currently buildout. Under the maximum future buildout, several AU groups show an increase in development along their shoreline. Focus on permit mitigations should be a major part to protect these shorelines from future impacts and achieve no net loss of functions. Net loss in one stream or lake will not be offset by mitigation/enhancement in another. Mitigation must be carried out within the same stream or lake. Under the current program two main types of permits exist to mitigate changes to shorelines, the Shoreline Substantial Development Permit and the Shoreline Conditional Use Permit. All activities and uses must comply with the current SMP provisions. Those that are not stated in Section 8 may be allowed (with a permit) and subject to approval.

The greatest percent of the shorelines are designated as Conservancy, River/Lacustrine, Aquatic, and Rural Residential. The designations with greatest development intensity (Shoreline Recreation, Shoreline Residential, and High Intensity) are concentrated within currently developed areas within the County.

Net increase in impervious surface, per group, shows the amount, in acres, that has the potential to be developed. This represents the worst case scenario or a 100 percent maximum buildout potential. Due to data inconsistencies, 13 AU groups could not be addressed in the impervious analysis. They are addressed qualitatively in Attachment 1, the summary of potential cumulative impacts. However, the bulk of the shorelines were analyzed. This data provides detailed information on where, spatially, potential future development may occur within the County's shorelines. When combined with the potential future land use designation, the County could further verify the amount of potential future development on a site-specific scale (e.g. at the parcel scale for program permits).

References

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Attachment 1. Summary of potential cumulative impacts associated with the proposed Shoreline Master Program

Attachment 2. General descriptions of AU stream and lake groups used to analyze potential cumulative impacts.

AENEAS LAKE Aeneas Lake is located in Section 25 T37N R26E. The lake measures 52.6 acres and is banded by a narrow strip of vegetation. An intermittent creek provides inflow, but there is no outflow. The lake is surrounded by some residential development and undeveloped lands within a matrix of agriculture, orchards, and range lands. A public access boat launch is operated by WDFW in the SE corner of the Lake and a common open space exists in the NE corner adjacent to a short plat.

ALBRIGHT LAKE Albright Lake, also known as Peninsula Lake, is located in Section 7 of T35N R26E with an area of 21.4 acres. The lake is undeveloped and surrounded by WDFW lands to the southwest and private range lands to northeast. There is a developed access point located in the SW corner on WDFW property. Vegetation around lake is limited and the alkaline water chemistry cannot support fish life.

ALKALI LAKE Alkali Lake is located in Section 22 of T35N R26E. Alkali Lake is a kettle lake with an area of 63.8 and a shoreline perimeter measuring 2 miles. The lake is surrounded by private land that is roughly 1/3 developed amidst undeveloped lands. No developed Public access is available on the lake. The water in Alkali Lake is considered alkaline, displaying a greenish blue tinge and its water chemistry cannot support fish.

ALTA LAKE Alta Lake is located in Section 15, T29N R23E. Alta Lake is 219.6 acres and measures about two miles long and half mile wide. The lake sits in a coulee at the base of steep forested and shrub steppe terrain. The lake contains no inflow or outflow. The north and eastern shoreline houses Alta Lake State Park, where a campground and trails provide visual and direct access to the lakeside including two boat launch ramps. Residential development for seasonal and full time homes exists along the western, northeastern and southern shores. The USFS owns a large portion of the east and west shorelines at the south end of the lake. Alta Lake is used for fishing, motor boating, and swimming.

ANTOINE CREEK Antoine Creek joins the mainstem of the Okanogan River at RM 61.2. The Antoine Creek group reaches approximately 5 miles and is oriented in an east-west direction. The creek drains a dry landscape of shrub and rangelands, with some irrigated fields through a narrow, steep-sided canyon noted for erosive gullies exacerbated by hoof sear. Management issues include bank erosion, noxious weeds, and heavy grazing.

BEAVER CREEK The Beaver Creek group includes those shorelines below the 20 cfs point in the lower 9 miles of the Beaver Creek. Beaver Creek is a high-moderate gradient, north/south creek draining mountainous terrain and undulating range lands. The creek enters the Methow River at RM 35. The shorelines are privately owned with the exception of the middle and upper reaches that lie within Department of Fish and Wildlife and Okanogan National Forest ownerships. Land uses along Beaver Creek are dominated by open range grazing; some irrigated fields and dispersed rural residences.

There is no public access to the creek within the lower 7 miles except for that provided at bridge crossings.

BIG TWIN LAKE Big Twin Lake is located in Section 15 T34N R21E. A kettle lake, Big Twin Lake is a deep depression lined by steep slopes to the SW, S, and East, while the Northern shoreline is a more gradual slope. It is fed by groundwater and supports a trout fishery. The lake measures 65.4 acres with a perimeter of 2 miles. WDFW owns a large portion of shoreline in the SW corner for fishing access as well as a boat launch in the NE corner of the lake. The surrounding land uses are rural residential and a private RV campground.

BLUE LAKE Blue Lake is located in 22 of T39N R27E. This kettle lake measures 205 acres. The lake is surrounded by private land with only one structure on the shoreline to date. There is a WDFW access point at the SW corner of the lake. The water in Blue Lake is considered alkaline, displaying a greenish blue tinge and its water chemistry cannot support fish.

BLUE LAKE (SIN) Blue Lake is located in Section 22 T37N R25E. The lake measures 205 acres in area. It is an artificial reservoir composed of a series of smaller natural lakes along the Sinlakehin River into one feature. The entire shoreline is owned by WDFW and there are four public access points, three with trailer launch ramps, and one with a hand launch site along the eastern shoreline.

BONAPARTE CREEK Bonaparte Creek drains roughly 98,738 (HUC 10) – 102,120 acres of sparsely developed range lands. This 4th order stream flows 24 miles from its headwaters in the east and winds westward to meet the Okanogan River at the city of Tonasket at Okanogan RM 56.7. The creek begins at a gentle gradient supporting a variable width of riparian vegetation and wetlands in its upper reaches. A complex wetland/riparian band can be found at its confluence with Peony Creek. The creek then flows through steeper terrain into a narrow canyon eventually cascading over a natural fall at river mile 1.0– just east of the city. This is where the Bonaparte Creek group ends. The falls create a natural barrier to fish migration, though resident trout and sculpin can be found above the falls. The entire creek is surrounded by private land, primarily used for agricultural grazing. The canyon section holds high potential for wildlife in a relatively undeveloped environment although issues related to winter grazing, hoof sheer erosion, lack of cover and invasive species were noted in the Sub Basin Plan. No known public access exists along its shorelines although the canyon is visible in the vicinity of the falls via an unofficial overlook at the Hwy 20 Bridge.

BONAPARTE LAKE Bonaparte Lake is located in Section 17 T38N R30E at an altitude of 3550 ft. It measures 151.7 acres. The lake is connected to a chain of small ponds and wetlands that serve as the headwaters of Bonaparte Creek. The shoreline is forested and owned mostly by Okanogan National Forest with exception of the SE corner that is owned by the state. A campground and boat launch in the southern tip is managed by ONF. There is also a small resort with lake access and one dock is located at a Boy Scout camp along the northern shoreline.

BOOHER LAKE Booher Lake is located at T35N R26E. The surface area of the lake is variable depending on hydrologic fluctuations, with a range of 18 – 29 acres. The lake is surrounded by private agricultural range lands with no structures in the shoreline to date. Pine Creek, and intermittent creek provides inflow to the lake; no outflow exists. No public access exists on the lake.

BREWSTER Shorelines in the Brewster Group include the banks of the Columbia River along the Wells Pools running from RM 527-536 as well as upstream along the Okanogan River where it meets the Columbia. These shorelines are within the city of Brewster and are characterized by tree fruit agriculture, residential and commercial uses. The majority of the waterfront shoreline area is owned by the Douglas County PUD. Access can be found at the city park, including two docks and a launch, and along the river walk in downtown Brewster. The shoreline along this portion has been greatly modified as part of the development of the Wells Dam impoundment. The entire shoreline has been stabilized with rip rap and supports a narrow band of riparian species in some areas. Fluctuations of the pool create variable habitat zones along the water's edge, and some side bar islands and wetlands do exist; however, the shoreline has been greatly simplified and is more reflective of lakeside environments than river systems.

The southern portion of this group encompasses the shoreline area parallel to US 97 and the BNSF rail road along the Columbia River between Brewster and Indian Dan Canyon, RM 529- 527. It is almost entirely owned by the Douglas County PUD. Those portions not owned by the PUD are composed of residential subdivisions near Brewster and some orchards and industrial uses related to agriculture and transportation. The shoreline through this section has been highly altered from hydroelectric development and includes heavy armoring to support and protect this vital transportation corridor for the railroad and highway. There is one developed access point operated by the PUD near RM 529.

BROWN LAKE Brown Lake is located in Section 7 T34N R26E. The lake measures 61.5 acres. It is a very shallow bottomed lake (14 ft max. depth) that emerges at the confluence of two unnamed creeks. Outflow is into Johnson Creek, a tributary to the Okanogan River. Little to no riparian vegetation exists, but the lake does support emergent aquatic vegetation along its edge. The lake is surrounded by open range land, with no formal public access.

CARLTON - TWISP The Carlton-Twisp group of the Methow River extends south from Twisp near the Hwy 20 Junction to Carlton -- RM 37.5 – 27.6. The upper portion of this group meanders through a wide, active channel, creating large gravel bars and mid-channel islands. As the river approaches Carlton the stream channel narrows and is surrounded by steep erosive bluffs. Riparian vegetation can be found along stable banks and wide bars. Bank stabilization has occurred throughout this group for road and land protection. There is no developed public access within this group. An informal public access exists between RM 33-34 on WDFW property. The surrounding land uses include rural residential and agriculture.

CARLTON LAMIRD The Carlton LAMIRD (Limited Area of More Intense Rural Development) group includes a 1 mile reach of river that encompasses the population center of Carlton centered on RM 27. Carlton houses a post office, RV park, motel, restaurant, general store and fire station, and shoreline uses include public access and dispersed rural residential development. A WDFW fishing access site serves this area adequately for access. It is a popular launch site for commercial and private float trips with a great swimming beach that brings in visitors to Carlton.

CHEWACK RIVER The Chewack (Chewuch) River group flows southwest from high elevations in the Pasayten Wilderness on USFS land through sparsely populated residential and agricultural lands until it meets the Methow River in the town of Winthrop. The Lower Chewack Watershed (HUC 10), which encompasses all shorelines designated in this SMP, drains nearly 200,000 acres of mountainous terrain through a surrounding landscape of forested slopes with patches of meadows in the highlands and shrub-steppe terraced hillsides in the lower reaches. Riparian cover is relatively continuous throughout the reach. There are 5 diversions for irrigation and extensive portions of the river's banks, including the alluvial fans of receiving streams have been rip-rapped for flood control. Public access along the Chewack is plentiful above RM 35 where various developed campgrounds and day use sites are managed by the USFS and WDFW. Informal and undeveloped access sites also exist. A new park, "Sa Teekh Wa", in the Town of Winthrop also provides shoreline access via a pedestrian bridge and riverfront trail. Limited access exists in the more heavily developed areas between RM 28 and 35, with the exception of one WDFW non-motorized (walk-in) location and a scattering of privately owned community open spaces. The Okanogan County Outdoor Recreation Plan identifies "river trails" as a high priority and this lower portion of the Chewack River has no trail system.

CHOPAKA LAKE Chopaka Lake is located in Section 4 T39N R25E. The lake measures 68 acres. It sits in a narrow trough with a north-south orientation and surrounded by steep forested slopes. The lake flows out into Chopaka Creek, a tributary of Sinlahekin River. The southwestern 1/3 is privately owned, but the remainder of the shoreline is publicly owned with one WDFW access and a BLM campground and access along the western shoreline.

CONCONULLY LAKE Conconully Reservoir is located in Section 18 T35N R25E. The reservoir is an artificial lake impounded by a USBOR dam built just below the confluence of the West and North Forks of Salmon Creek in 1910. Used for irrigation storage, the lake now supports broad recreational and residential uses. Surrounding land uses include open range, agriculture, urbanization and forest lands. Most of the land around the lake is owned by the federal Bureau of Reclamation with much of the north and western shorelines leased to the owners of private cabins and several small resorts. Public access is found along the NE corner at Conconully State Park, as well as at the southern shoreline at the dam.

CRAWFISH LAKE Crawfish Lake is located in Section 35 T35N R29E. The lake is 80 acres in area. The lake sits in a shallow basin amidst a forested landscape of gentle

slopes. About 1/3 of the shoreline is privately developed with recreational cabins, including some docks. Approximately half of the shoreline lies within the bounds of the Colville Indian Reservation. Public access is available at the northeast corner in USFS campground.

DAVIS LAKEDavis Lake is located in Section 20 T34N R22E. The lake, 39.8 acres in area, is fed by an unnamed creek the flows in from the east; no outflow exists, though the lake does terminate to the north in a wetland. There is a public boat launch operated by WDFW at the northern tip of the lake and the southwestern quarter of the lake is owned by the federal government. A small RV park occupies the eastern shoreline. Otherwise, the lake is privately owned and surrounded by open range lands characterized by shrub-steppe habitat.

DUCK LAKE Duck Lake is located in Section 10 of T34N R26E. The lake is in a closed basin with no outflow. However it is fed by Johnson and Salmon Creeks as well as supplemented by irrigation diversions. The water is used for irrigation. Surrounding land uses included limited residential development and open range land. The margins of the shoreline support some woody vegetation. There is no public access.

EAST OSOYOOS The East Osoyoos group is differentiated from West Osoyoos based on its relative lower level of development. While there are some undeveloped portions of the shoreline, the shoreline still remains primarily in agricultural use. In recent years there has been an emerging resort development as agricultural lands are converted. Access is on this side of the lake to private parcels and resorts. The entire lake is within the city of Oroville with much of the existing development served by city water and a growing number of sewer connections.

EVANS LAKE Evan Lake is located in Section 28 of T35N R26E. It is a silt bottomed alkaline lake measuring 32.7 acres. The shoreline is entirely privately owned with no public access or road for access. Surrounding land uses include open space rangeland and one seasonal cabin.

FANCHER DAM RES Fancher Dam Reservoir is located in Section 35 T39N R28E. The lake is 26 acres in area. The reservoir is impounded by a dam built in 1923 at the headwaters of Antoine Creek for livestock watering. The southern shoreline and outflow area is heavily forested. There are no public access sites, as the shoreline is entirely privately owned.

FIELDS LAKE Fields Lake is located in Section 26 of T40N R29E. The lake measures 25 acres. The sinuous shoreline of the lake is lined by a narrow band of forested vegetation. The lake is fed by a perennial stream as part of the headwaters of Mary Ann Creek, a tributary to Myers Creek. The shoreline is owned by a single private ownership and has no public access.

FISH LAKE Fish Lake is located in Sect 22 T36N R25E. The lake measures 101.6 acres. The lake is fed by Gibson Creek and sits in a narrow coulee where the outflow

forms Coulee Creek. The northern shoreline is a steep, rocky slope with little vegetated cover. The southern and western shorelines support forested and wet meadows. Public access is provided via a road that circumscribes the lakeshore and campgrounds along the southern shore. The entire shoreline is owned by the USFS or WDFW.

GOLD CREEK Gold Creek drains a narrow valley of shrub-steppe and forested slopes in the Lower Methow Sub-watershed (HUC 10). The drainage flows west to east and empties into the Methow River at RM 22.7 and the group includes roughly 4 ½ miles of shoreline. The lower 3.5 miles of the creek has been channelized with rip rap, restricting lateral channel movement (Methow Subbasin Plan, 2004). This group is surrounded by rural residential property that supports grazing and timber harvest. There is no public access along the creek other than an undeveloped USFS site located just east of the Middle Fork Gold Creek Road.

GREEN LAKE Green Lake is located in Section 13 T34N R25E. The surface area measures 45 acres. The lake sits in a narrow forested valley and the lake is oriented north-south with an average width less than 500 ft. WDFW operates an access site on the eastern shoreline with a boat launch while the remaining shorelines are privately owned and undeveloped.

HORSESHOE LAKE Horseshoe Lake is located in Section 17, T36N R26E, just east of Albright (Peninsula) Lake. It is an alkaline kettle lake measuring 36 acres. The majority of the shoreline is surrounded by open rangeland, though the southern boundary has been subdivided for seasonal homes. There is no established public access; however, there is a large parcel of state-owned land in the northwest corner of lake.

KEYSTONE - TONASKET The Keystone-Tonasket Group extends south along the Okanogan River from the southern boundary of Tonasket at RM 56.1 – 52.3. This area occupies a broad floodplain with rural residential and agricultural uses. Residential and agricultural uses have minimized the extent of riparian vegetation as well as the complexity of the channel. The channel is primarily a single course though some mid-channel islands do exist, suggesting a degree of dynamism through this group. There are no developed public access points throughout this section.

KEYSTONE CANYON The Keystone Canyon group extends from the Janis Bridge at RM 52.3 to RM 41.7 just north of Riverside. The river is confined to a narrow, steep canyon through much of this group, limiting the extent of a natural floodplain. Where a floodplain does exist, agricultural fields occupy the landscape, confining the river to a single channel. Much of this reach lacks robust riparian vegetation or channel complexity due to natural topography and agricultural conversion. Public access does not exist outside of informal right of ways or bridge crossings.

LAKE PATEROS Shorelines in the Lake Pateros group include the banks of the Columbia River along the Wells Pool running downstream from RM 523 to the confluence with the Methow River and extending up the Methow to RM 1.7. It is characterized by the inundation zone of the Wells Pool along the Columbia and the

Methow within the urban growth boundary of Pateros. This area has been heavily altered by inundation and filling. The entire shoreline is composed of up to nine feet of fill and is therefore supported by continuous rip rap along the shoreline. The majority of the waterfront shoreline is owned by the Douglas County PUD. Native riparian vegetation can be found in portions of the Methow River where mid-channel islands, bars, and wetlands have been established for wildlife. The majority of the group, however, is dominated by residential lawns or parkland landscaping along the PUD lands. Residential and commercial development line the north bank of Lake Pateros and the Methow River while public access is provided in the at numerous PUD locations and city parks. WDFW operates 2 access sites in this reach, including a boat launch and fishing site. It is a popular site for all types of watercraft including rafts, kayaks, motorized boats and jet skis. The WDFW site on the south bank of the Methow across from Pateros is the primary take-out site for commercial float trips on the lower Methow River.

LEADER LAKE Leader Lake is located in Section 16 T33N R25E. The lake area measures 155 acres and the perimeter is 4 miles in length. The lake is a natural lake supplemented by diversions from Loup Loup Creek and artificially controlled by a dam built circa 1910, but would otherwise drain into Tallant Creek. The shoreline is surrounded by open range lands and sparsely forested hillsides. Approximated 1/3 of the western shoreline is publicly owned and operated by WDFW for fishing, boating, and camping access.

LEMANASKI LAKE Lemanaski Lake is located in Section 3 T37N R25E. The lake measures 20 acres. There is a private dam that impounds the lake to supplement water supply. The lake is privately owned with no public access other than informal ROW access along the western shoreline.

LITTLE TWIN LAKE Little Twin Lake is located in Section 14 T34N R21E. Similar to Big Twin Lake, the water is ground fed and sits in a steep basin. Little Twin Lakes shares a boat launch access site with Big Twin Lake and is otherwise surrounded by private community open space owned by the surrounding rural residents.

LOST CREEK Lost Creek flows in a northeast direction from T34N, R30E to T35N, R31E approximately 7 miles. The creek lies in a V-shaped basin and drains a gently sloping, forested landscape almost entirely owned by the ONF before it enters into the West Fork of the Sanpoil River. Surrounding land uses are forestry and open rangelands. No developed public access exists.

LOWER METHOW The Lower Methow Group extends from RM 12.8 beginning at the southern boundary of the population center known as Methow to the inundation zone of Lake Pateros at RM 1.7. This shoreline landscape is characterized by steep bluffs that form narrow reaches of canyon topped by wide benches that support rural residential development and orchards. Sandy point bar beaches are formed through wider reaches in this section and this group is popular for white water rafting. It is served by informal access points at HWY 153 bridge crossings at RM 5 and 6 and an access using County

road right of way at the Burma Road Bridge. USFS owns parcels along the shoreline between RM 9-10 which hold potential for access, however, only a single developed access point exists (A WDFW site) between Methow and the WDFW sites on Lake Pateros as the majority of this reach is privately owned.

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LOWER OKANOGAN The Lower Okanogan group extends from RM 16.7 of the mainstem of the Okanogan River, and the tributary, Loup Loup Creek, downstream to the confluence with the Columbia River at the northern boundary of Brewster. This reach of the river is impounded by Wells Dam on the Columbia River, creating a large, slow moving pool. The shoreline is dominated by agricultural uses, primarily orchards and hay fields. Riparian vegetation is stable due to the infrequent scour and flooding in this zone caused by the impoundment. The banks are silt and sand. The river divides Okanogan County shoreline jurisdiction from the Colville Confederate Tribe's jurisdiction on the eastern shoreline. Public access along the Lower Okanogan can be found at RM 0.5 at a WDFW fishing access and again at RM 4.5 at a PUD site. Between RM 4.5-16.7 no developed access exists. Informal access can be found along Monse River Road in the lower few miles, but otherwise this group has limited access. Loup Loup Creek contains native resident trout and steelhead but suffers from de-watering from irrigation diversions farther upstream. Eastern brook trout have likely out-competed native bull trout in the system. Anadromous fish cannot pass beyond RM 1 on Loup Loup Creek where a natural falls occurs.

LOWER SALMON The Lower Salmon group extends from approximately RM 4.3 at the Okanogan Irrigation Diversion Dam to the Confluence with the Okanogan River. This portion of Salmon Creek does not satisfy the 20 cfs minimum for inclusion in the SMP. However, restoration efforts by the Colville Confederated tribes are securing 10 cfs for Steelhead habitat.

LOWER SIMILKAMEEN The Lower Similkameen group includes those shorelines adjacent to the Similkameen River from RM 8.8 at the Enloe Dam downstream to the vicinity of the old rail trestle (RM 6.5). This is a turbulent section of river incised into a steep, sparely vegetated bedrock canyon.

LOWER SINLAHEKIN The Lower Sinlahekin group reaches from RM 10 on the Sinlahekin River at the confluence with Toats Coulee to RM 6.5 where the river empties into Palmer Lake. The river is highly sinuous and historically would have been multi-channeled. However, surrounding agricultural uses have restrained the river to a single channel. Nonetheless, at the Toats Coulee confluence, a wide wetland complex exists. No public access is found within this portion of the river.

LOWER WELLS POOL Shorelines in the Lower Wells Pool group include the banks of the Columbia River along the Wells Pool running from RM 517-522 just south of the confluence with the Methow River. The shoreline here has been greatly modified by inundation from hydroelectric development. Land uses through this group include agriculture and grazing and the shoreline is largely owned by the Douglas County PUD. One developed WDFW public access is located near RM 518.

MALOTT LAMIRD The Malott LAMIRD group includes those shorelines within this unincorporated community along the main stem of the Okanogan River. The Okanogan River shorelines in the LAMIRD contain residential and some limited commercial development. Shorelines in Malott support rural, low density residential and agricultural uses.

MAZAMA The Mazama group begins below where Early Winters Creek flows into the Methow River just upstream from the population center known as Mazama. This group extends downstream through a wide glacially carved valley to RM 50.9 just west of the Town of Winthrop. In addition to shorelines along the mainstem, this group also includes shorelines associated with Wolf Creek extending approximately 2 miles upstream to the 20 cfs mark. Major tributaries include Goat Creek, Fawn Creek, and Wolf Creek. The Methow River is very dynamic through this group, supporting a wide flood plain and channel migration zone with robust riparian forests, side channel habitats, and ox-bow wetlands. Despite the high level of ecologic integrity in this group, shoreline modifications have been made for highway and property protection. Surrounding land uses are characterized by irrigated hay fields, rural residences, seasonal homes, and small-scale resorts and rentals. Access to the river includes Big Valley Ranch, a WDFW property; the Community trail in Mazama; and Early Winters Campground at the confluence of Early Winters Creek and the Methow River. There is also informal access points along road right of ways and at private common areas created via short and long plats.

MEDICINE LAKE Medicine Lake is located in Section 5 T35N R26E. It is an alkaline, kettle lake measuring 43.1 acres. The shoreline is entirely privately owned with no public access and surrounded by open range land.

METHOW - CARLTON This group runs from the population center of Carlton downstream to the community of Methow, RM 26.7 – 13.3. This group is characterized by a narrowing of the valley floor and numerous steep, forested tributaries that empty in the mainstem of the Methow River, including Cow Creek, Libby Creek, Gold Creek, McFarland Creek, and French Creek. Irrigated pastures and cropland, orchards,

rangelands, and rural residential uses border the shorelines. Riparian vegetation is limited to narrow bands along the often steep banks, though some point bars do support vigorous groves of gallery forests. Highway modifications have hardened and confined the banks around most of the large meanders. There are only two developed public access points within this group, though many informal and common areas provide local access to residents. Public lands along the shoreline between RM 26-24 could hold potential for more access.

METHOW LAMIRD The Methow LAMIRD (Limited Area of More Intense Rural Development) group includes a ½ stretch of shoreline that falls within the small community known as Methow and centered around RM 13. Point bars support some riparian vegetation along the shoreline through this group, but much of the river is confined by steep banks in this section with little riparian cover. Shoreline ownership through this section is privately owned (except for a parcel owned by the Pateros School District - Methow Community Center) and primarily residential and agricultural in nature, although a private RV campground lines the north eastern shoreline. Resort and residential development is rapidly occurring in the vicinity of Methow which may cause an increase in demand for river access and services in Methow. The nearest public access is located at the French Creek Road junction where Hwy 153 crosses the river just north of the community.

MIDDLE METHOW The Middle Methow group extends from RM 47.5, just south of the town of Winthrop to the RM 41.9 to the Town of Twisp. This extremely active portion of river contains wide meanders and supports a dynamic channel with abandoned and active side channels and mid-channel islands. Riparian forests of mixed cottonwoods and Ponderosa pine line the variable sloped banks and gravel bars. The surrounding land uses are primarily irrigated alfalfa fields, small-scale row crops, and rural residential homes, though there is an airport and some industrial uses as well. Open spaces in this section of river valley support large numbers of mule deer. Public access is limited to informal access along highway right-of-ways, and common areas; that is, no developed public access exists within this group.

MIDDLE OKANOGAN The Middle Okanogan group extends downstream from RM 23 in the vicinity of Barnholt Loop to just below RM 20 north of Malott. The shoreline area is in transition from resource to residential uses and has some areas with extensive floodplain.

MIDDLE SIMILKAMEEN The Middle Similkameen River group runs northeast from the confluence with Palmer Creek at RM 19.5 then arcs downstream to the southeast where it ends at Enloe Dam. This portion of river sits in a relatively wide valley with a low gradient and supports an active floodplain. Surrounding slopes include shrub-steppe and forested habitats, while agricultural fields occupy first and second flood terraces. Abandoned mines and mill sites and small-scale gold dredge mining occurs within this reach of the river. It is believed that Salmon never reached this portion of the Similkameen. Riparian cover is limited by agricultural use. Public access occurs at

informal pull-outs along the Loomis-Oroville Rd with one primitive BLM campsite located at Similkameen Camp.

MIDDLE SINLAHEKIN RIVER The Middle Sinalhekin group runs north from RM 16.5 -10. It drains a forested valley and supports a flood plain. This group ends just below the confluence with Toats Coulee Creek. At the confluence and below, a wide wetland complex exists. Surrounding uses include agriculture, forestry, and open range as well as public access.

MILES LAKE Also known as Big Buck Lake, Miles Lake is fresh water lake located at T34N R21E. The outflow into an unnamed creek (Frost Creek) is completely diverted into irrigation canals that serve rural properties along the Twisp River valley. The lake is surrounded by range land and one residential unit. WDFW owns the southern 1/3 portion of the lake, while the remaining 2/3rd is privately owned.

MOCCASIN LAKE Moccasin Lake is located in Section 17 T34N R21E. This 32 acre lake is a privately owned lake with no public access but does have a private dock. The lake is surrounded by rangelands and protected via a private conservation easement.

MOLSON LAKE Molson Lake is located in Section 8 T40N R29E and is immediately SW of Sidley Lake where it separated by a road bed. The lake measures 20 acres. This is a shallow (maximum depth 20ft), silt bottomed lake that supports aquatic plants. The surrounding land use is open range land. There is no development along the shoreline. Public access is provided at NW corner of the lake at a WDFW site.

MUSKRAT LAKE Muskrat Lake is located in Section 15 T39N R29E. The lake measures 40-45 acres depending on water levels. This lake is an extremely shallow (maximum depth 6 ft), silt bottomed lake subject to de-watering. It is surrounded by private agricultural and range lands. There is little potential for public access given the water depth and quality, though options for habitat enhancement may exist.

OKANOGAN CITY The Okanogan City group includes those shorelines along the main stem of the Okanogan River near the City of Okanogan as well as lands downstream along the Okanogan River to the vicinity of Barnholt Loop. Salmon Creek is the major tributary for this section river. However, Salmon Creek does not meet the 20 cfs minimum required for designation of its shoreline due to irrigation withdrawal 4.3 miles upstream. The main stem of the Okanogan River through this group is confined to a single channel by channelization and armoring for levees and flood control. A narrow band of riparian vegetation exists throughout the group however, providing a green buffer. Land uses span the range of urban development from rural residential, commercial, educational, institutional and industrial uses throughout this group. Public Access exists at the Alma City Park, at the entrance to the Wastewater Treatment Plant and informal access points exist at Legion Park, at city owned property surrounding the treatment plant and along road rights-of-way and bridge crossings. Overall, access to the riverfront is limited within the City limits.

OMAK - RIVERSIDE The Omak-Riverside group extends from RM 40 – 35. This portion of river is primarily constrained to a single wide channel with very little channel complexity. There are two side channel islands located at RM 35 and 38 that support riparian vegetation. Shoreline riparian vegetation is limited by agricultural development throughout much of the group, however, much of the areas between the railroad and river along the eastern bank contains riparian vegetation. Land uses include rangelands, agriculture, industrial and rural residential. There is no developed public access although there are right of ways that are used as informal access points.

OMAK CITY The Omak City group runs from near the northern boundary of Omak downstream to the city of Okanogan's northern boundary. The river through Omak takes on a variety of characteristics ranging from free flowing and complex at the lower portion to Corps of Engineers built levees and steep bluffs abutting the river through the heart of the city. Along Aston Island side channels support active wetlands. This wilder portion gives way to a constrained portion where a levees line both sides of the shoreline through the downtown where uses include residential and commercial developments. The northern reaches through Omak and north support rural residential development amidst a unique landscape pocked by massive boulders in the floodplain. Riparian vegetation is typically established between the armored banks and the river throughout this reach. The Omak Eastside Park and Stampede Grounds is an important cultural site in this group. Public access exists at the Stampede Grounds as well as at Aston Island and Pioneer Park. The northern portion has limited public access.

OROVILLE CITY Shorelines within the Oroville City group include portions of the Similkameen and Okanogan Rivers upstream of their confluence and within the most heavily developed areas of Oroville. This group is urbanized, yet the river systems maintain a high degree of channel complexity, including wide meanders, wetlands, and side channels. Development along the rivers includes commercial, industrial, and residential uses. WDFW also holds large tracts of land south of the confluence on Okanogan River (Driscoll Island). River access is well provided for in the northern portion of this group on the Okanogan. The southern portion contains two WDFW access sites in the vicinity of the confluence. Lake Osoyoos State Park, located at the outlet of Lake Osoyoos into the Okanogan River provides a developed access and a variety of recreation improvements.

The Similkameen River portion of the group begins where the river emerges from the narrow canyon at the old rail trestle. The river is sinuous and levels out creating large meanders and a well developed floodplain associated with the confluence with the Okanogan River. Surrounding land uses include orchards, range lands, and rural – urban residential at Oroville. Public access is available at the 12th Street Bridge and sewer treatment plant in Oroville.

PALMER CREEK CONFLUENCE The Palmer Creek Confluence group encompasses the confluence of the Similkameen River and Palmer Creek which flows from Palmer Lake. This is area is very complex, sinuous wide floodplain that hosts a complex wetland system of active and abandoned meanders from the Similkameen and Palmer Creek.

Grazing has altered plant composition, but the confluence support a diverse assemblage of riparian and wetland habitat types. There are no public access areas within this group.

PALMER LAKE Palmer Lake is located in Sect 11 T39N R25E. Measuring at over 2,000 acres, this is a lake of Statewide Significance. The shoreline is both privately and publicly owned. The lake is a glacially carved trough fed by the Sinlahekin River. Outflow of the lake is via Palmer Creek which flows into the Similkameen River through a complex, braided wetland system. Surrounding land uses are primarily open range lands with some orchards to the east. The south and western shoreline is a steep, barren hillside with rock outcrops, whereas the north and eastern edges are more gradual and lined with vegetation. Private development along the eastern shoreline consists of permanent and seasonal residences and some private docks. There is a developed boat launch at the southern tip of the lake, a DNR campground and resort near the northern end and other public, undeveloped access points on the west and northern shorelines.

PATTERSON LAKE Patterson Lake is located in Section 19 of T34N R21E. The lake measures 160.3 acres. The lake is fed by Rader Creek and a small impoundment on the northern end maintains water levels where it empties into a series of beaver ponds and a single channel that eventually gets diverted for irrigation. The lake is heavily used for recreational fishing, non-motorized boating, swimming and hiking. There is a resort located on the northern shore with a common dock, as well as a launch site along the eastern shore that is operated by WDFW. Trails for hiking and mountain biking parallel the WDFW lands along the western shoreline while the southern end is privately owned and supports irrigated fields.

PEARRYGIN LAKE Pearrygin Lake is located in Section 36 of T35N R21E. The lake measures 182 acres. The lake is fed by two perennial streams, Pearrygin Creek and an unnamed creek. The outflow is captured for irrigation via canal. The glacially carved lake sits in a narrow valley where it abuts a forested slope to the south and open shrub-steppe habitat to the north. The majority of the shoreline is owned by Washington State Parks and the park is used heavily for watercraft, camping, hiking and fishing. WDFW owns the eastern shoreline, and there are some private in-holdings along the southwest corner of the lake.

RAT LAKE Rat Lake is located in Section 22 of T31N R24E. It is an artificial lake created by an old dam built prior to 1917 for irrigation at the headwaters of Whitestone Creek. Today, it is managed for flood control. Surface area measures 61.2 acres. The eastern shoreline is privately owned while the western shoreline is owned by the federal government. There is small boat launch, operated by WDFW, at the southern tip of the lake at the dam.

RIVERSIDE TOWN The Riverside Town group includes those shorelines along the Okanogan River within and to the south of the incorporated location of Riverside, RM 41.7 – RM 36, including the alluvial fan at the confluence of Johnson Creek. The Okanogan River takes a sweeping S-shaped bend through Riverside where the banks are armored with a levee for flood protection. Riparian vegetation waterward of the levee is

intact and robust, but limited to this narrow strip. The surrounding land uses include residential within the town proper and agriculture outside the town center. There are two developed public access sites within Riverside.

ROBERTS LAKE Roberts Lake is located in Section 9 T35N R25E. This shallow bottomed lake measures 34 acres and fluctuates greatly depending on water levels. The shoreline does not support woody riparian vegetation. The surrounding land is privately owned, and the uses are open range; there is no public access.

SALMON/CONCONULLY LAKE Salmon Lake is located in Section 6 T35N R25E. The surface are measures 292 acres. The lake is impounded by a dam along the western edge where an outlet releases water into the North Fork of Salmon Creek where it flows into Conconully Reservoir. The lake sits in a narrow valley trough at an east-west orientation, surrounded by steep forested hillsides. The lake is almost completely surrounded by public lands, including Forest Service and State lands. Land leases for cabins on BOR lands occur along the northern shoreline. Public access is found in the vicinity of the Dam and a WDFW launch site and resort on the northern shore.

SIDLEY LAKE Sidley Lake is located in Section 6 T40N R29E. The lake measures 104.8 acres. This high altitude lake sits a 3660 ft and has an average depth of 17 feet. The northern shoreline has been structurally modified to support Nine Mile Road. The west and SW shorelines have been platted and contain cabins and homes. Docks are present along private lands. Public access is available at the eastern shoreline where a WDFW launch site is shared with Molson Lake. No public beach exists.

SINLAHEKIN HEADWATER The Sinalhekin flows from Blue Lake T37N, R25E and travels northward through a series of ponded, shallow pools connects by a meandering channel of low gradient. This portion of the river is flanked by relatively steep forested banks, but occupies a flat valley that supports flooding and extensive shrub wetlands along the banks. There are numerous WDFW campsites along the river for fishing and camping.

SPECTACLE LAKE Spectacle Lake is located in Section 2 T38N R26E. The lake is 313 acres in area. The lake sits in a narrow valley trough with an orientation east-west. The northern shoreline supports orchards, small resorts and range land at the toe of gentle, bare slopes, whereas the southern shoreline is bordered by steep bluffs of undeveloped ONF land with scattered trees and forests.

TALKIRE LAKE Talkire Lake is located in Section 22 T36N R28E. The lake measures approximately 38 acres when full. The basin lies within Chewiliken Creek and this shallow bottomed basin is prone to de-watering to form more of a wetland. It is entirely surrounded by private, open range lands and has no public access.

TOATS COULEE Toats Coulee is a narrow stream channel draining steep slopes in T39N, R25E. The creek follows an easterly direction and is incised in a V-shaped channel where there is little to no floodplain. South facing slopes support open habitats

of grasslands and shrubs, whereas the northern aspects are forested. Most of the lower reaches of shoreline are privately owned, and undeveloped, whereas the State owns and manages portions of the upper reaches. No pubic access is developed along the creek.

TONASKET CITY The Tonasket City group includes those shorelines within Tonasket. At Tonasket, three tributaries, Bonaparte Creek, Siwash Creek, and Unnamed Creek, flow into the main stem, creating a wide shoreline jurisdiction. Uses include commercial, residential, and some industrial areas in the central group, while agricultural, orchards, and rural residential are found outside. Public access is developed at Lagoons City Park. Informal access exists History Park and at bridge crossings and ROWs, but otherwise is limited in town.

TORODA CREEK Toroda Creek is located in the far NE corner of the county in T39N, R31E. It is a tributary of the Kettle River in neighboring Ferry County. Toroda Creek drains a shrub steppe-forested landscape of gentle to steep slopes. The creek is of moderate gradient supporting a narrow floodplain occupied by agricultural fields and grazing lands. There is no public access along this portion of shoreline.

TWISP RIVER The Twisp River group begins at the Eagle Creek and flows east to a point a couple miles upstream from Twisp, approximately 12 miles. The Twisp River is a major tributary of the Methow River and support anadromous fish. Much of the river has been channelized through diking and riprap for property protection to support surrounding agricultural and residential uses. Despite this, riparian forests are still supported as is a narrow flood plain. The river meanders through a series of terraced benches where surrounding properties are rural residential and agricultural in nature. Public access can be found about 5 miles upstream at WDFW site and at ONF sites. However, the lower reaches are underserved for public access given the proximity to Twisp and the surrounding residential developments.

TWISP TOWN The shorelines in the Twisp Town group include those portions of the Twisp and Methow Rivers within Twisp. The Twisp River portion of this group begins about 2 miles upstream from the Town and is generally unconstrained. As the Twisp River reaches Town, it is stabilized by a flood levee on the southern bank. Where the Methow and Twisp rivers meet, a dynamic alluvial fan from the Twisp inputs large gravels, boulders and cobbles, creating large bars during low water. This area is heavily used by town residents and visitors for fishing, swimming, and beach combing. Surrounding land uses are primarily residential, open space and parks, and a large amount of former industrial and agricultural land. The mainstem of the Methow River is channelized through town and reinforced for bridge abutments at Highway 20. A narrow riparian forest of cottonwoods lines the otherwise steep banks. Public access on the Methow is provided as Twisp park, at the end of E. 2nd Avenue and informal access for foot traffic is found at the Highway 20 bridge. Access on the Twisp is found at the Methow Salmon Recovery Foundation property and at the county road bridge just west of the Town limits.

UPPER METHOW The Upper Methow group begins just upstream of where Lost River joins the Methow River. This portion of river is highly dynamic, draining a vast wilderness landscape of steep forested hills and snow and glacially covered peaks. The river flows in a south east direction where numerous small tributaries and streams contribute sediment and flows. Early Winters Creek enters the system at RM 67.5 creating an alluvial fan where the river meanders through large cobbles and sediments, creating a complex channel structure. This group is highly active with a wide floodplain that actively recruits new cottonwoods and riparian vegetation. Shorelines are largely forested and relatively undeveloped in this group although vacation and full time homes, including a few large track conservation properties and resorts, do occupy the surrounding lands. Public access is highly developed via a trail network for both summer and winter access to the river.

UPPER OKANOGAN The Upper Okanogan group begins at the confluence of the Similkameen River with where lake Osoyoos outflows and forms the Okanogan at Oroville and runs south 15 miles, RM 76 - 61. The river meanders southward through a wide floodplain that narrows as it approaches Tonasket at RM 58. The confluence area is a low gradient, complex channel with multiple wide meanders, side channels, wetlands, point bars, and islands. This portion supports seasonal grazing, but is otherwise free flowing and dynamic. As the floodplain begins to narrow near RM 64, orchards and intensive agriculture begin to dominate the surrounding landscape. No developed or established public access exists within this 15 mile stretch.

UPPER SIMILKAMEEN The Upper Similkameen begins at the Canadian border in T40N R25E to RM 22.3 where it adjoins the Palmer Creek, the outflow of Palmer Lake. This portion of river supports a wide floodplain with a robust complex channel, marked by side channel wetlands, abandoned oxbows and lush riparian vegetation. Land uses are primarily grazing and interspersed agriculture. Access to the Upper Similkameen is available at two WDFW sites located at RM 23.6, and RM 26.2, respectively.

WALKER LAKE Walker Lake is located in Section 27 T38N R30E. The lake is 40 acres in area. The lake is nearly circular in shape and shallow with a maximum depth of 32 feet. The lake bottom is sandy clay and the shoreline is lined by a sandy beach around its entire perimeter. The western shoreline is forested whereas the eastern shoreline is open rangeland. The shoreline is privately owned with no public access.

WANNACUT LAKE Wannacut Lake lies with T39N R26N in Section 24. The lake sits in a north/south trough surrounded by moderately forested hills. The shoreline measures approximate 5 miles in length. The eastern shoreline has been heavily subdivided for residential/vacation cabins, while the western shoreline is still intact and supports open range lands. There is one public access site in SW corner of the lake with a boat ramp.

WEST OSOYOOS The West Osoyoos group is located in Section 22 T40N R27E. Lake Osoyoos measures 2055 acres and therefore constitutes a shoreline of statewide significance. There are extensive gravel and sand beaches along the shoreline. West Osoyoos constitutes its own group based on its high level of residential development

including homes and docks. The entire lake is designated within the city of Oroville (and is served by public water and some sewer). Public access is found along the western shoreline at the City of Oroville Deep Bay with picnic, launch and swimming areas and numerous private campgrounds and small resorts that provide access.

WEST SANPOIL RIVER The West Fork of the Sanpoil River drains an area of nearly 200,000 acres. This portion of the Sanpoil runs in a SE direction from T36N, R30E to T35N, R31E for approximately 10 miles before it enters the mainstem of the Sanpoil. The surrounding landscape includes forested slopes and open rangelands. The West Fork of the Sanpoil sustains an actively floodplain with wide meanders that supports agriculture and grazing. Ownership includes private and Forest Service lands. No public access is documented.

WHITESTONE LAKE Whitestone Lake is located in Section 17 T38N R27E. The lake measures 147 acres. The lake is a natural, silt-bottomed lake but is supplemented by irrigation and detained by a small dam. The lake is used for recreation with several small resorts and irrigation storage. The northeastern shoreline has been stabilized for the Loomis-Oroville RD. A boat launch on State land provides access.

WINTHROP TOWN Shorelines in the Winthrop Town group include the Chewack River from about RM 0.5 downstream to the confluence with the Methow River, and the Methow River between RM 49-51. Where these rivers meet is a dynamic braided channel. Efforts to control channel movement have resulted in a flood control levee along the right bank of the Methow (which serves a ski trail in the winter) and extensive rip rap along the Chewack to protect riverfront businesses and two bridges. Nevertheless, this highly developed portion of the river still maintains a high level of ecological integrity and the Winthrop Park offers direct public access at the confluence for fishing, swimming and light boat craft launch. A pedestrian bridge at the north end of downtown provides access to a new park area along the Chewuch River and in south Winthrop, Heckendorn Park provides access to the Methow. Visual access to the river is an important feature to the town's identity as the riverfront properties command high real estate values. Recreation and commercial interests are a top priority for shorelines in this group.

Attachment 3. Watershed scale analysis to assess current condition of key process. There are two maps for each key process evaluated, the first showing key areas and the second alterations.

Attachment 4. RFFA data tables

Attachment 5. GIS methods specific to future impervious surface calculation

Create Setback

- GIS Erase difference land and Analysis Units to identify water - *AUWater*
- GIS Intersect *AUWater* and Shoreline Buildout parcels to determine overlap - *AUWaterSB*
- Calculate new field in *AUWaterSB* for setback (in feet) per designation
- Buffer *AUWaterSB* polygons by setback – *AUWaterSB_buffer*

Apply Setback *AUWaterSB_buffer* to Shoreline Buildout and AU Groups

- For Shoreline and AU Groups GIS Erase setback to create new files and add new field to recalculate acreages taking into account setback

Combine Setback Shoreline Buildout to NLCD Imperviousness

- GIS Identify to combine Shoreline Buildout to NLCD Imperviousness – *ShorelineBuildoutNLCDIdentify*

Combine *ShorelineBuildoutNLCDIdentify* to AU Groups

- GIS Identify to combine AU Groups *to ShorelineBuildoutNLCDIdentify* – Groups*ShorelineBuildoutNLCDIdentify*
- Recalculate acreage of Impervious acres per area
- Calculate SBMaxLot which is the Setback Shoreline Buildout Acres multiplied by the Maximum Lot Coverage per designation
- Calculate SBDifImp which is the difference between the Maximum acres of Shoreline Buildout and impervious cover in Shoreline Buildout
- Calculate PercSBDeve which is the percentage of developable land in the shoreline buildout area.